Remarks

The Office Action mailed March 19, 2004 and the Advisory Action dated June 3, 2004 have been carefully reviewed and the following remarks are made in consequence thereof.

Claims 1-20 are pending. Claims 1, 3, 4, 9. 12, 13, and 18 are amended. No new matter has been added. Claims 1-20 stand rejected.

This Amendment is submitted in lieu of an Appeal Brief, and therefore is accompanied by a Request for Continued Examination (RCE). In accordance with 37 C.F.R. 1.136(a), a one month extension of time has already been submitted to extend the due date of the Appeal Brief from September 19, 2004, through and including October 19, 2004. In accordance with 37 C.F.R. 1.17(a)(1), authorization to charge a deposit account in the amount of $110.00 to cover this extension of time request was also submitted therewith. If the extension of time needed for entry of this Amendment and the RCE has been calculated incorrectly and/or the fee amount specifically authorized is insufficient or if the separately filed request for extension of time was not received, the Office is hereby authorized to consider this a request for the necessary extension of time and/or to charge Deposit Account No. 07-0845 the necessary fees.

The objection to Claims 1 and 16 raised in the Office Action of March 19, 2004 is respectfully traversed. Claims 1 and 16 were amended in an Amendment filed May 24, 2004 in a manner as suggested in the March 19, 2004 Office Action. Applicant therefore respectfully requests the objection be formally withdrawn.

The rejection of Claims 1, 3-6, 9, and 11 under 35 U.S.C. § 103 as being unpatentable over Toth et al. (U.S. Patent 5,982,846) in view of Oomori et al. (Japanese patent application number JP 03259569A) and Fujise (U.S. Patent 4,641,328) is respectfully traversed.

Toth et al. describe a detector array that includes a plurality of detector modules (20) (column 3, lines 61-62). The detector includes a plurality of modules and each module includes a plurality of detector cells (column 2, lines 58-60). A detector which has non-segmented cells along the z-axis, and/or a detector which has multiple modules with multiple elements along the x-axis and/or z-axis joined together in either direction to acquire multislice scan data simultaneously, can be utilized (column 2, lines 60-65). The detector module includes a switch apparatus (66) electrically coupled to a decoder (68) (column 4, lines 8-9). The switch apparatus is a multidimensional semiconductor switch array of similar size as the photodiode array (column 4, lines 9-11). In one embodiment, the switch apparatus includes an array of field effect transistors with each field effect transistor (FET) having an input, an output, and a control line (column 4, lines 11-14). Particularly, each switch apparatus FET input is electrically connected to a photodiode array output and each switch apparatus FET output is electrically connected to DAS, for example, using flexible electrical cable (70) (column 4, lines 16-19).

Notably Toth et al. are silent with respect to "staggered half detector segments [that] are abutted in regions about a centerline extending in the z-direction, and, in abutting said half detector segments, ... a first type of detector module having a cable extending in the z-direction into [a gap between staggered detector segments] and a second type of detector module having a cable extending in the x-direction into said gap." Although the Office asserted that Toth et al. discloses detector segments comprising first and second modules having flexible cables extending in two and one directions (Fig. 5 of Toth, at #70), these cables both extend in a z-direction, not an x-direction. Instead, all of the cables in Toth et al. are shown extending in a z-direction from the detector modules in the detector array. No cables from detector modules are shown extending into a gap between abutting half detector in perpendicular directions relative to other any other cable from a different type of detector module.

However, as shown in Fig. 1, 2, and 8 and at page 8, lines 7-11 of the present Application, some configurations of Applicant's invention include two different types of detector modules

any staggered half detector segments that are separated by a gap therebetween, and any staggered half detector segments are abutted in regions about a centerline extending in the z-direction. Applicant respectfully traverses the assertion that "Toth et al. discloses…a plurality of staggered half detector segments abutted in regions about a center line (Fig. 4, #20)" on page 3, lines 1 to 7 of the Office Action dated March 19, 2004. Rather, Toth et al. discloses a known detector array including a plurality of full sized module detector sections 20.

Oomori et al. describe a method in which an electrode is provided on a periphery of split electrodes for forming a unit detecting element in a unit (Purpose). The method enhances concentration resolution of a radiation image-receiving device (Purpose). When the units are arranged for constituting an array, all the split electrodes are arranged in a zigzag form in such a way that they are positioned at equal intervals in a longitudinal direction of the array (Purpose, Figure 4). Even assuming, *arguendo*, that Oomori et al. teach or suggest abutting detector segments, insofar as Applicant is able to determine, Oomori et al. does not show or suggest "staggered half detector segments [that] are abutted in regions about a centerline extending in the z-direction, and, in abutting said half detector segments, ... a first type of detector module having a cable extending in the z-direction into [a gap between staggered detector segments] and a second type of detector module having a cable extending in the x-direction into said gap," and Applicant can find no teaching or suggestion of two types of detector modules in the apparatus or method of Oomori et al.

Fujise describes a computed tomography apparatus in which data is acquired during one or more full rotational cycles and suitably stored by scanning a beating heart or similar objects and in which a complete image corresponding to a cross section of the beating heart is produced

on a CRT screen and is correlated with a specific portion of the heart cycle reconstructed from the limited data taken during a time interval which is a small fraction of the duration of the heart cycle (Abstract). Fujise teaches an "array of detector devices 18," and how many detectors there might be in the array at col. 6, lines 15-20, but otherwise does not teach or suggest an arrangement of detector modules or any kind of detector segments, with or without gaps.

By contrast, Claim 1, as herein amended, recites, *inter alia,* "... acquiring attenuation data from a plurality of staggered half detector segments of the detector array, wherein said staggered half detector segments are separated by a gap therebetween, said staggered half detector segments are abutted in regions about a centerline extending in the z-direction, and, in abutting said half detector segments, there are included a first type of detector module having a cable extending in the z-direction into said gap and a second type of detector module having a cable extending in the x-direction into said gap ...". No such method of acquiring attenuation data from staggered half detector segments of a detector array having such construction is shown or suggested by Toth et al., Oomori et al., or Fujise, or by any combination thereof. It is therefore submitted that Claim 1 is patentable over Toth et al. in view of Oomori et al. and Fujise.

Independent Claim 3 is drawn to an apparatus and has been amended to recite similar features. Therefore, it is submitted that Claim 3 is patentable over Toth et al. in view of Oomori et al. and Fujise for reasons similar to that given with respect to the patentability of Claim 1.

Claims 4-6, 9, and 11 depend from independent Claim 3. When the recitations of Claims 4-6, 9, and 11 are considered in combination with the recitations of Claim 3, Applicant submits that dependent Claims 4-6, 9, and 11 likewise are patentable over Toth et al. in view of Oomori et al., and further in view of Fujise.

For the reasons set forth above, Applicant respectfully requests that the Section 103 rejection of Claims 1, 3-6, 9, and 11 be withdrawn.

The rejection of Claims 2 and 7 under 35 U.S.C. § 103 as being unpatentable over Toth et al. in view of Oomori et al. and Fujise, and further in view of Cuppen (U.S. Patent 6,259,766) is respectfully traversed.

Toth et al., Oomori et al., and Fujise are described above. Cuppen describes a detector system, looking in a direction from an X-ray source, of a computer tomography device while using a first adjustment of an X-ray collimator (column 5, lines 34-37). The detector system is arranged in the computer tomography device in such a manner that its rows extend in a transverse direction and its columns extend in a longitudinal direction (column 5, lines 41-44). In the detector system, detector cells in a first column from the left have a width of 5 mm whereas those in second and third columns have a width of 2 mm, those in fourth and fifth columns have a width of 1 mm, those in sixth and seventh columns have a width of 2 mm, and those in eighth column have a width of 5 mm (column 5, lines 46-53). These widths are dimensions in the transverse directions over which the individual detector cells are essentially sensitive to X-rays which have traversed a patient to be examined and reach the detector system (column 5, lines 53-57). Although the detector system includes cells of different width, there is no teaching or suggestion of abutting half detector segments having two types of detector modules, wherein a first type has a cable extending in the z-direction into a gap between staggered half detector segments and another type has a cable extending in the x-direction into the gap.

However, Applicant's Claim 2 depends on Claim 1 which recites *inter alia,* "... acquiring attenuation data from a plurality of staggered half detector segments of the detector array, wherein said staggered half detector segments are separated by a gap therebetween, said staggered half detector segments are abutted in regions about a centerline extending in the z-direction, and, in abutting said half detector segments, there are included a first type of detector module having a cable extending in the z-direction into said gap and a second type of detector module having a cable extending in the x-direction into said gap ...". No such method of

acquiring attenuation data from staggered half detector segments of a detector array having such construction is shown or suggested by Toth et al., Oomori et al., Fujise, or Cuppen, or by any combination thereof. When the recitations of Claim 1 are considered in combination with the recitations of Claim 2, it is thus submitted that Claim 1 is patentable over Toth et al. in view of Oomori et al. and Fujise, and further in view of Cuppen.

Applicant's Claim 7 depends upon Claim 3, which contains a recitation of a structure similar to that of the structure used in the method of Claim 1. No such structure is shown or suggested by by Toth et al., Oomori et al., Fujise, or Cuppen, or by any combination thereof. When the recitations of Claim 7 are considered in combination with the recitations of Claim 3, it is thus submitted that Claim 7 is also patentable over Toth et al. in view of Oomori et al. and Fujise, and further in view of Cuppen for reasons similar to those given with respect to Claim 2.

For the reasons set forth above, Applicant respectfully requests that the Section 103 rejection of Claims 2 and 7 be withdrawn.

The rejection of Claim 8 under 35 U.S.C. § 103 as being unpatentable over Toth et al. in view of Oomori et al., Fujise, and Cuppen, and further in view of Hsieh (U.S. Patent 5,974,109) is respectfully traversed.

Toth et al., Oomori et al., Fujise, and Cuppen are described above. Hsieh describes double and triple cell ganging which resolves any incompatibility between a number of detector channels and a lower number of DAS channels without requiring any significant hardware and software changes (column 2, lines 24-28). In one embodiment, detector cells on one side of a detector are wired in pairs, i.e., ganged, to form sets of 2 mm channels, and on the other side of the detector outside a FOV, some detector cells are wired together, i.e., ganged, to form sets of 3 mm channels and some detector cells are ganged to form sets of 2 mm channels (column 2, lines 28-35). Such ganging of detector cells avoids having to make any significant hardware and software changes to known multislice CT systems (column 2, lines 35-37). However, Hsieh is

silent on the subject of staggering half detector segments, on the subject of gaps therebetween, and on the subject of the directions in which cables extend from detector elements into the gap.

Claim 8 depends from Claim 3. Claim 3 recites, "A radiation detector for an imaging system, said radiation detector having a centerline extending in a z-direction and comprising a plurality of staggered half detector segments abutted in regions about said centerline and separated from one another by a gap, said staggered half detector segments each comprising a plurality of detector modules, and, in abutting said half detector segments, there are included a first type of detector module having a cable extending in the z-direction into said gap and a second type of detector module having a cable extending in the x-direction into said gap."

None of Toth et al., Oomori et al., Fujise, Cuppen, and Hsieh, considered alone or in combination, describe or suggest a such a radiation detector. Thus, when the recitations of Claim 8 are considered in combination with the recitations of Claim 3, Applicant submits that dependent Claim 8 is patentable over Toth et al. in view of Oomori et al., Fujise and Cuppen, and further in view of Hsieh.

For the reasons set forth above, Applicant respectfully requests that the Section 103 rejection of Claim 8 be withdrawn.

The rejection of Claim 10 under 35 U.S.C. § 103 as being unpatentable over Toth et al. in view of Oomori et al. and Fujise, and further in view of Hoffman et al. (U.S. Patent 5,799,057) is respectfully traversed.

Toth et al., Oomori et al., and Fujise are described above. Hoffman et al. describe a scatter collimator that is not complicated and cumbersome to construct, and that effectively absorbs scattered x-rays and substantially prevents such x-rays from impinging a detector array (column 2, lines 49-52). However, Hoffman et al. does not teach or suggest a first type of

detector module having a cable extending in the z-direction into a gap and a second type of detector module having a cable extending into the x-direction into said gap.

Claim 10 depends on Claim 3, as amended, which recites "A radiation detector for an imaging system, said radiation detector having a centerline extending in a z-direction and comprising a plurality of staggered half detector segments abutted in regions about said centerline and separated from one another by a gap, said staggered half detector segments each comprising a plurality of detector modules, and, in abutting said half detector segments, there are included a first type of detector module having a cable extending in the z-direction into said gap and a second type of detector module having a cable extending in the x-direction into said gap."

None of Toth et al., Oomori et al., Fujise, and Hoffman et al., considered alone or in combination, describe or suggest a such a radiation detector. Thus, when the recitations of Claim 10 are considered in combination with the recitations of Claim 3, Applicant submits that dependent Claim 10 is patentable over Toth et al. in view of Oomori et al. and Fujise, and further in view of Hoffman et al.

For the reasons set forth above, Applicant respectfully requests that the Section 103 rejection of Claim 10 be withdrawn.

The rejection of Claims 12-16, 18, and 20 under 35 U.S.C. § 103 as being unpatentable over Toth et al. in view of Oomori et al., Cuppen, Fujise, and Gordon (U.S. Patent 6,188,745) is respectfully traversed.

Toth et al., Oomori et al., Cuppen, and Fujise are described above. Gordon describes a controllable switch that is provided at the output of each detector element so that a detector element can be used to acquire data when the switch is on, and ignore any sensed data when the switch is off (column 3, lines 33-36). All outputs of the detector elements of each column are summed together so that when a particular set of rows is switched on, the outputs of the switched

detector elements of each column are summed together (column 3, lines 36-40). Image artifacts can result should a detector switch be defective for one or more of the detector elements being used to receive and convert X-ray photons (column 4, lines 12-14). A spatially encoded detector arrangement is designed so as to allow for more efficient detection areas for slices of various thicknesses, and preferably one or more sets of simultaneously generated multiple slices (column 4, lines 26-30). The detector elements are sized and arranged so that at least some of the detector elements provided in each of the columns have lengths that vary in the Z-axis direction in accordance with a predetermined sequence code that represents all of the whole integer values in equal incremental values from 1 to N, wherein N is a whole integer greater than 1 (column 4, lines 47-53). However, among other things, Gordon does not teach or suggest two types of detector modules, one having a cable extending in the z-direction into a gap and another having a cable extending in an x-direction into the gap.

Claim 12, as herein amended, recites, *inter alia*, "a multislice detector array having a z-direction parallel to the axis of rotation of the gantry and an x-direction transverse to the z-direction, said multislice detector array configured to rotate with the rotating gantry and configured to acquire attenuation data from a patient between the radiation source and the detector, said detector array comprising a plurality of staggered half-detector segments separated from one another by a gap and abutted in regions about a centerline extending in the z-direction, said half-detector segments configured to provide attenuation data having a relatively higher spatial resolution near a centerline extending in the z-direction of said detector array and a relatively lower spatial resolution distal to said centerline, wherein, in abutting said half-detector segments, there are included a first type of detector module having a cable extending in the z-direction into said gap and a second type of detector module having a cable extending in the x-direction into said gap ... ". No such arrangement of staggered half-detector segments, gaps, and abutting segments, along with two types of detector modules, one having a cable extending in the z-direction into the gap and another having a cable extending in an x-direction into the gap is

shown or suggested by any of Toth et al., Oomori et al., Cuppen, Fujise, and Gordon, considered alone or in combination. Therefore, it is submitted that Claim 12 is patentable over Toth et al. in view of Oomori et al., Fujuise, Cuppen, and Gordon.

Claims 13-16, 18, and 20 depend from independent Claim 12. When the recitations of Claims 13-16, 18, and 20 are considered in combination with the recitations of Claim 12, Applicant submits that dependent Claims 13-16, 18, and 20 likewise is patentable over Toth et al. in view of Oomori et al., Cuppen, Fujise, and Gordon.

For the reasons set forth above, Applicant respectfully requests that the Section 103 rejection of Claims 12-16, 18, and 20 be withdrawn.

The rejection of Claim 17 under 35 U.S.C. § 103 as being unpatentable over Toth et al. in view of Oomori et al., Cuppen, Fujise, and Gordon, and further in view of Hsieh is respectfully traversed.

Toth et al., Oomori et al., Cuppen, Fujise, Gordon, and Hsieh are all as described above. As explained in the discussion of these references with respect to other claims, none teach or suggest a multislice detector array as recited in Claim 12 "... having a z-direction parallel to the axis of rotation of the gantry and an x-direction transverse to the z-direction, said multislice detector array configured to rotate with the rotating gantry and configured to acquire attenuation data from a patient between the radiation source and the detector, said detector array comprising a plurality of staggered half-detector segments separated from one another by a gap and abutted in regions about a centerline extending in the z-direction, said half-detector segments configured to provide attenuation data having a relatively higher spatial resolution near a centerline extending in the z-direction of said detector array and a relatively lower spatial resolution distal to said centerline, wherein, in abutting said half-detector segments, there are included a first type of detector module having a cable extending in the z-direction into said gap and a second type of detector module having a cable extending in the x-direction into said gap ... ". Therefore, Claim

12 is patentable over Toth et al. in view of Oomori et al., Cuppen, Fujise, and Gordon, and further in view of Hsieh.

Claim 17 depends on Claim 12. When the recitations of Claim 17 are considered in combination with the recitations of Claim 12, Applicant submits that dependent Claim 17 likewise is patentable over Toth et al. in view of Oomori et al., Cuppen, Fujise and Gordon, and further in view of Hsieh.

For the reasons set forth above, Applicant respectfully requests that the Section 103 rejection of Claim 17 be withdrawn.

The rejection of Claim 19 under 35 U.S.C. § 103 as being unpatentable over Toth et al. in view of Oomori et al., Cuppen, Fujise, and Gordon, and further in view of Hoffman et al. is respectfully traversed.

Toth et al., Oomori et al., Cuppen, Fujise, Gordon, and Hoffman et al. are all as described above. As explained in the discussion of these references with respect to other claims, none teach or suggest a multislice detector array as recited in Claim 12 "... having a z-direction parallel to the axis of rotation of the gantry and an x-direction transverse to the z-direction, said multislice detector array configured to rotate with the rotating gantry and configured to acquire attenuation data from a patient between the radiation source and the detector, said detector array comprising a plurality of staggered half-detector segments separated from one another by a gap and abutted in regions about a centerline extending in the z-direction, said half-detector segments configured to provide attenuation data having a relatively higher spatial resolution near a centerline extending in the z-direction of said detector array and a relatively lower spatial resolution distal to said centerline, wherein, in abutting said half-detector segments, there are included a first type of detector module having a cable extending in the z-direction into said gap and a second type of detector module having a cable extending in the x-direction into said gap ...

". Therefore, Claim 12 is patentable over Toth et al. in view of Oomori et al., Cuppen, Fujise, and Gordon, and further in view of Hoffman et al.

Claim 19 depends from Claim 12. When the recitations of Claim 19 are considered in combination with the recitations of Claim 12, Applicant submits that dependent Claim 19 likewise is patentable over Toth et al. in view of Oomori et al., Cuppen, Fujise and Gordon, and further in view of Hoffman et al.

For the reasons set forth above, Applicant respectfully requests that the Section 103 rejection of Claim 19 be withdrawn.

In view of the foregoing remarks, this application is believed to be in condition for allowance. Reconsideration and favorable action is respectfully solicited.

Respectfully Submitted,

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Alan L. Cassel
Registration No. 35,842
ARMSTRONG TEASDALE LLP
One Metropolitan Square, Suite 2600
St. Louis, Missouri 63102-2740
(314) 621-5070